



Guest Editorial

Enjoying the Research Journey

At the Mechanisms & Robotics Awards Luncheon held September 2, 2009 in San Diego, CA, Dr. Larry L. Howell, Professor of Mechanical Engineering at Brigham Young University, received the 2009 ASME Mechanisms & Robotics Award. At the luncheon, Professor Howell distributed copies of a compilation of essays from the ASME Mechanisms & Robotics community and the compilation was accompanied by the following comments.

Larry L. Howell
Professor

I grew up in a small, remote community in the mountains of Utah, where I spent much of my youth hiking and camping in the surrounding wilderness. Sometimes I would go alone, but usually I would make these treks with one or more friends. We would enjoy each other's company, help each other through difficult terrain, and enjoy the beauty of the high desert wilderness. We had talked to old-timers about where to find water, the best times to see buck deer fight, and where to camp to hear the echo of coyotes barking at sunrise. One of the greatest thrills in these adventures would come when I was far from civilization and would realize that I was likely standing in a spot where no human had ever stood before. I found that idea to be exciting and exhilarating.

I discovered engineering when I went away to college and also spent time in Finland—quite a technologically oriented society—and found that engineering carries the same excitement that I enjoyed in the adventures of my youth. That includes being able to go where no one has gone before, to enjoy the journey with great colleagues, and to use the knowledge of those who have gone before. It may be instructive to explore the analogy of standing where no one has stood before in the context of mechanisms and robotics research.

Engineering offers the thrill of standing where no one has stood before, or in this case, doing what no one has done before. As engineers we can make new discoveries, design new products, and use our skills to benefit society. What an amazing thing it is to have such opportunities. But the excitement of doing new things also brings with it some anxiety. As we leave our solved problems, we may wonder what the future problem will be and how we'll solve it. Or, worse yet, we ponder the unthinkable fear: will there even be a next problem? This conflict is a natural part of engineering, but, as I tell my students, the day engineers aren't needed is the day the world no longer needs new or better ways of doing things.

We have been fortunate in the area of mechanisms and robotics to have successfully solved many problems and to still have many important problems ahead of us. Not unlike other disciplines, many of the new problems lie between the boundaries of disciplines. This has been the case in my own recent experience in compliant mechanisms research. In one project, which involves collaboration with microbiologists and other engineers, we are mechanically manipulating single egg cells. Another project, this one in collaboration with an expert on spinal biomechanics, seeks to create compliant mechanisms as artificial discs for the human spine. The spinal disc has a complex three-dimensional non-linear force-deflection relationship, a compact space, extreme constraints on materials, and no tolerance for failure. But compliant mecha-

nisms offer the potential to mimic the force-deflection relationship of the natural spinal disc and the potential to help many people suffering with serious pain and disability.

A simplistic view of our discipline is that we physically move objects in prescribed ways. As long as advances in ways to achieve motion continue to make valuable contributions, there will be a need for our research. Fortunately, advances in many important areas are facilitated or enhanced by advances in mechanisms and robotics. For example, consider the Grand Challenges for Engineering described by the U.S. National Academy of Engineering. It is a broad list that covers many disciplines, but a careful review shows that advances in mechanisms and robotics will enhance and facilitate success in those topics. Some areas of future mechanism contributions are obvious, such as "Engineer the Tools of Scientific Discovery." The previously mentioned mechanism for mechanically manipulating living cells is an example that can have an impact on biological research. Other areas are less obvious, such as "Secure Cyberspace." But a possible way of securing electrical systems is to require opening and closing of physical connections in prescribed ways, such as the "Strong Links" used for mechanically safing and arming nuclear weapons. While safing and arming mechanisms are cost prohibitive for most applications, analogous mechanical systems may be developed for other security-sensitive systems. And there are many other examples of connections to the Grand Challenges. There is an endless list of how those of us working in mechanisms and robotics can stand where no one has stood before and make great contributions to society in the process.

Another highlight of the wilderness trips of my youth was associating with friends where we helped each other through difficult terrain and enjoyed the journey together. This is not unlike the collegiality that I've experienced in my professional life. My doctoral adviser at Purdue University was Professor Ashok Midha. He was a great mentor and had a tremendous impact on my life and my career. He took me and his other graduate students to the mechanisms and robotics conferences and he often referred to the "mechanisms community." It took me years to understand the implications of this term, but considering our group of colleagues to be a community is accurate and profound. We are fortunate to have a community where we are able to move forward professionally and to have friendship and collegiality that makes the journey more rewarding.

Like the young hikers, our community relies on the knowledge of those that have gone before. Ways to honor our predecessors include remembering their contributions, building on the founda-

tions they have laid, and following their example by boldly addressing the new problems before us.

We have remarkable opportunities before us and a wonderful heritage to support us. Let's enjoy the journey together.

Submitted by Stephen Canfield
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